PRINT DATE: 01/13/94

PAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: M7-3A-E4-X

SUBSYSTEM NAME: TUNNEL ADAPTER - ECLSS

REVISION : 0 01/13/94 W

PART NAME VENDOR NAME PART NUMBER VENDOR NUMBER

LRU :

EQUALIZATION VALVE CARLETON TECHNOLOGIES MC250-0004-0012

2763-0001-9

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS: EQUALIZATION VALVE, TUNNEL ADAPTER/SPACELAB HATCH "D".

QUANTITY OF LIKE ITEMS: 2 TWO ON HATCH "D"

FUNCTION:

PROVIDES PRESSURE EQUALIZATION ACROSS THE TUNNEL ADAPTER AND SPACELAB HATCH. EACH VALVE OPERATES INDEPENDENTLY WITH POSITIVE DETENTS AT TWO FLOW POSITIONS. VALVE CAN BE ACTUATED FROM EITHER SIDE OF HATCH.

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	FAILURE MODES EFFECTS ANALYSIS (FMEA) CRI	TICAL FAILURE MODE KUMBER: M7-3A-E4-03		
	SUBSYSTEM: TUNNEL ADAPTER - ECLSS	REVISION		
	LRU : EQUALIZATION VALVE ITEM NAME: EQUALIZATION VALVE	CRITICALITY OF THIS FAILURE MODE:1/1		
	# FAILURE MODE: EXTERNAL LEAKAGE			
	MISSION PHASE: OO ON-ORBIT			
	► VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 CO : 103 DI : 104 AT : 105 EN	SCOVERY LANTIS		
■ CAUSE: MECHANICAL SHOCK, VIBRATION, CORROSION, POROSITY ■ CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO				
				■ REDUNDANCY SCREEN A) N/A
1	B) N/A C) N/A			
	PASS/FAIL RATIONALE:			
•	■ A)			
•	■ 8)			
•	= C)			
	- FAILURE EFFECTS -			
•	■ (A) SUBSYSTEM: INABILITY TO ISOLATE SPACELAB FROM TUNNEL ADAPTER.			
•	■ (B) INTERFACING SUBSYSTEM(S): POSSIBLE EXCESSIVE LOSS OF CONSUMABLES IF EVA IS CONDUCTED.			
•	C) MISSION:			

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NUMBER: M7-3A-E4-03

- (D) CREW, VEHICLE, AND ELEMENT(S):

 POSSIBLE LOSS OF EVA CREWMAN IF CONTINGENCY EVA IS REQUIRED AND TUNNEL ADAPTER CANNOT BE REPRESSURIZED FOR RETURN TO CABIN; EVA CREWMEN MUST REMAIN IN AIRLOCK UNTIL LANDING.
- (E) FUNCTIONAL CRITICALITY EFFECTS: NONE.

- DISPOSITION RATIONALE -

■ (A) DESIGN: UNIT IS FLANGE MOUNTED WITH A SINGLE SILASTIC-675 SILICONE RUBBER O-RING WHICH COMPENSATES FOR ROUGHNESS OF FLANGE, PREVENTING EXTERNAL LEAKAGE. HOUSING IS FABRICATED OF A356.0-T61 ALUMINUM ALLOY AND IS X-RAYED TO DETECT CRACKS.

■ (B) TEST:

QUALIFICATION TEST FOR 100 MISSION LIFE: ACCELERATION OF 5 G FOR FIVE MINUTES PER AXIS. SINUSCIDAL VIBRATION -5 TO 35 HZ AT +/- 0.25 G PEAK PER AXIS. RANDOM VIBRATION - 0.09 G**2/HZ FOR 48 MINUTES PER AXIS. DESIGN SHOCK - 20 G PER AXIS. THERMAL VACUUM/THERMAL CYCLE - WITH VALVE CLOSED AND CAP ON, UNIT EXPOSED TO +120 TO +130 F AND VACUUM OF 1 X 10 EXP -6 TORR FOR 24 HOURS. LOW/HIGH TEMP CYCLE - HELD AT -40 TO -50 F FOR 3 HOURS AND AT +120 TO 130 F FOR 3 HOURS. OPERATING LIFE - OPERATED OFF/MORMAL/EMERGENCY POSITIONS WITH 15 PSIG APPLIED FOR 800 CYCLES. LEAKAGE MONITORED DURING OR AFTER THESE TESTS LIMITED TO 5 SCCM MAX.

ACCEPTANCE TEST - PROOF PRESSURE 25 PSIG GN2, WITH VALVE OPEN AND CLOSED. LEAK CHECK AT 15 PSIG, 5 SCCM MAX - VALVE OPEN AND CLOSED AND REVERSE LEAKAGE.

- OMRSD 3.2 PSID LEAK CHECK PERFORMED AT OPF AFTER TUNNEL ADAPTER INSTALLATION. GROSS LEAKAGE TEST AT 2 PSID BEFORE EACH FLIGHT.
- (C) INSPECTION: RECEIVING INSPECTION MATERIALS VERIFIED AT RECEIVING INSPECTION. ALUMINUM HOUSING CASTINGS ARE HYDROSTATIC PROOF PRESSURE TESTED AT 32 PSID.

CONTAMINATION CONTROL
CORROSION PROTECTION PROVISIONS AND CONTAMINATION CONTROL PLAN
VERIFIED BY INSPECTION. CLEANLINESS LEVELS AND IOO ML RINSE TESTS
VERIFIED.

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ASSEMBLY/INSTALLATION MANUFACTURING PROCESSES, INSTALLATION AND ASSEMBLY VERIFIED BY INSPECTION. TORQUES VERIFIED BY INSPECTION. DIMENSIONAL CHECKS PERFORMED BY INSPECTION. INSPECTION PERFORMS MIPS FOR CONCENTRICITY AND PERPENDICULARITY.

NONDESTRUCTIVE EVALUATION ALUMINUM HOUSING CASTINGS ARE X-RAYED AND DYE PENETRANT INSPECTED TO DETECT CRACKS, VERIFIED BY INSPECTION.

CRITICAL PROCESSES PASSIVATED PARTS AND HEAT TREATMENT VERIFIED BY INSPECTION. MECHANICAL SOLDERING OF DEBRIS SCREEN VERIFIED BY INSPECTION. ANODIZATION OF ALUMINUM PARTS VERIFIED BY INSPECTION.

TESTING ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING PARTS PROTECTION VERIFIED BY INSPECTION.

- (D) FAILURE HISTORY: NO FAILURES.

•	(E) OPERATIONAL USE: NONE.	
	- APPROVALS -	
	RELIABILITY ENGINEERING: H. M. TO DESIGN ENGINEERING : S. CASTILLO QUALITY ENGINEERING : M. SAVALA NASA RELIABILITY : NASA SUBSYSTEM MANAGER : NASA QUALITY ASSURANCE : EDITORIALLY APPROVED : RI EDITORIALLY APPROVED : JSC TECHNICAL APPROVAL : VIA CR	200 10/12/92 550/100 10/12/92